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Factors Associated with Delays to Diagnosis and Treatment of Breast Cancer in Women in a Louisiana Urban Safety Net Hospital

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Only lung cancer surpasses breast cancer as a cause of death from cancer. However, the burden of cancer is not borne equally across racial and ethnic groups. In the United States, African American women have significantly higher mortality rates from breast cancer than white women. Delayed follow-up of breast abnormalities and delays from diagnosis to treatment may contribute to higher mortality. This study examined factors associated with delays to diagnosis and treatment of breast cancer in a group of white and African American women. Identified from tumor registry records were 247 women with pathology-confirmed first primary in situ and invasive breast carcinomas with no known previous cancer diagnosis. Factors associated with delays from provider recognition of abnormality to breast cancer diagnosis (diagnostic delays) and from diagnosis to treatment (treatment delays) were determined using chi-square tests and logistic regression. Factors that were considered included age, race, stage of disease at diagnosis, tumor size, type of abnormality, type of medical service at presentation, and prior mammogram within the past two years. The proportion of women experiencing diagnostic delays was high, with more African American women experiencing delays than white women (34% versus 17%, respectively).

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African American and white women did not differ in distribution of stage of cancer at diagnosis. Significantly smaller tumor sizes were found in women experiencing diagnostic delays compared to those not experiencing delays. Conversely, women experiencing treatment delays were significantly older and had larger tumor sizes compared to those not experiencing delays. More African American women experienced delays in diagnosis; however these delays did not appear to affect outcomes. Older age as a significant factor in treatment delays suggests that comorbidities as well as other possible barriers to treatment warrant further investigation in older women. The reasons for racial disparities in breast cancer outcomes remain and call for further study.

KEYWORDS breast cancer, early detection, cancer disparities, mammography

Breast cancer is second only to non-melanoma skin cancer as the most frequently diagnosed cancer in women, and only lung cancer surpasses breast cancer as a cause of death from cancer in women in North America (Center for Disease Control and Prevention [CDC], 2007). Unfortunately, the burden of breast cancer is not borne equally across racial and ethnic groups. While African American (AA) women have a significantly lower incidence of breast cancer than white women in the United States, they have significantly higher mortality rates (American Cancer Society, Breast Cancer Facts & Figures, 2009–2010). Beginning in the early 1980s, breast cancer mortality rates for AA women exceeded those for white women and, in 2005, were 36% higher than white women in the United States (American Cancer Society, Breast Cancer Facts & Figures, 2009–2010). Mortality rates in AA women in the United States as a whole have been decreasing at a trend similar to white women since 1995. However, in Louisiana, while the mortality rate in white women has been decreasing steadily since the early 1990s, the mortality in AA women has remained virtually unchanged (Figure 1). Louisiana consistently ranks at or below the national average for incidence of breast cancer in AA women but significantly above the national average for mortality (Hsieh et al., 2010). National data for 2004 rank Louisiana equal with Washington, DC as first for deaths from breast cancer (CDC, 2007).

Early detection of breast cancer results from a combination of screening for abnormalities and timely and appropriate follow-up for these abnormalities. Screening mammography is a powerful tool that has proven effective in decreasing mortality from breast cancer. Annual mammography with adequate follow-up is estimated to result in reductions in mortality ranging from almost 12% to 70% (Anderson, Jatol, & Devesa, 2006; Blanchard et al., 2004;

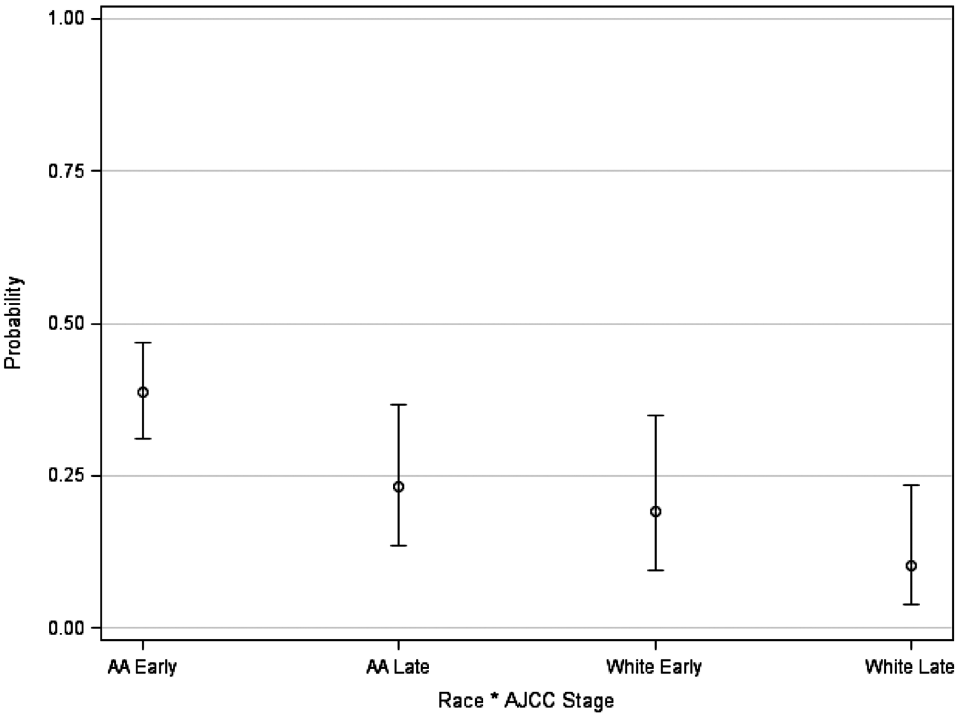

FIGURE 1 Predicted probabilities and 95% confidence limits for diagnostic delay by race and AJCC stage.

Collette et al., 1984; Gofman, 1996; Nyström et al., 2002; Tabar et al., 2003; Randolph et al., 2002; Shapiro, Strax, & Venet, 1971; Shapiro, Venet, & Strax, 1982; Tabar et al., 1985; Verbeek et al., 1984).

While breast cancer prognosis improves when the disease is detected and treated early, AA women in Louisiana do not seem to benefit from early detection to the same degree as white women (National Breast and Cervical Cancer Early Detection Program [NBCCEDP], 2010). One potential reason for this inequity may be inadequate or delayed follow-up after an abnormality is found. Delays in diagnosis or treatment can undermine the benefits that screening mammography can offer in detecting tumors while they are more amenable to cure (e.g., early stage and small size). More than any other ethnic or racial group, AA women have been found to experience delays in receiving care for breast cancer, even after adjusting for age, marital status, comorbidities, stage, hormone receptor status, tumor size, lymph node involvement, usual source of care or provider, and other factors (Gorin et al., 2006; Gwyn et al., 2004; Lund et al., 2008; Wujcik et al., 2009). These delays include excessive time from initial abnormality detection to biopsy-proven diagnosis of that abnormality, and from diagnosis to initiation of treatment. Past research has shown that as many as 40% of AA women have experienced

delays, defined as 2, 3, or 6 months. AA women have as high as 4.7 times the risk for delay compared to white women (Gorin et al., 2006; Gwyn et al., 2004; Lund et al., 2008; Wujcik et al., 2009). Richards et al. (1999) found that delays as short as 3–6 months from abnormality to start of treatment resulted in a 12% decrease in 5-year survival rates.

The NBCCEDP (2007) of the CDC has set standards of 60 days or less from abnormality to diagnosis and from diagnosis to initiation of treatment. To accomplish this, the NBCCEDP provides case management for every woman in its program with an abnormal result. The intent is to detect breast tumors at very small sizes. However, the promise that early detection will decrease breast cancer mortality can only be realized if detection is followed by timely diagnosis and treatment.

The Medical Center of Louisiana at New Orleans (MCLNO) is part of the public hospital system in Louisiana that serves under- and uninsured residents of low socioeconomic status and all races. Louisiana has a history of operating a two-tiered medical system that directs the uninsured into the state-run system. State and federal funds are paid almost exclusively to the state hospitals, segregating the uninsured as much as possible from the insured (Hood, 2007). Approximately 85% of the funding for hospitals is generated from Medicaid or uncompensated care patients (LSU Health Sciences Center, 2003). These patients would have household incomes at or below 200% of the federal poverty level ($36,620 for a family of three in 2009); (U.S. Department of Health and Human Services, 2009). The relative homogeneity of MCLNO patients lends itself to the exploration of the relationships among diagnostic and treatment delays, race, and stage in an indigent population. The purpose of this study was to determine factors associated with delays to diagnosis and treatment of breast cancer in a group of white and AA women from the MCLNO. The study hypothesizes that proportionately more AA women experienced delays in diagnosis and treatment of breast cancer than their white counterparts, and that diagnostic and treatment delays were associated with later stages of the disease. A better understanding of factors affecting timely diagnosis and treatment of breast cancer is needed if efforts to eliminate racial disparities are to succeed.

METHODS

Study Data

These analyses were based upon two sets of data: Louisiana Tumor Registry (LTR) data and MCLNO electronic medical record extraction. The LTR has collected complete, statewide, population-based data on all newly diagnosed cancers since 1988. In 2000, the LTR was added to the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute

registries based upon the quality of the data and the high proportion of rural AAs in Louisiana. LTR data have been certified for quality, timeliness, and completeness for inclusion in calculating the "U.S. Combined Cancer Incidence Rates" reported by the North American Association of Central Cancer Registries (NAACCR) since inception of the certification in 1997. Two hundred and forty-seven females with pathology-confirmed first primary in situ and invasive breast carcinomas (International Classification for Diseases of Oncology site codes C50.0–50.6 and C50.8–50.9) with no known previous SEER cancer diagnosis from the period of January 1, 2002 through December 31, 2004 were identified. Exclusion criteria were diagnosis at death or autopsy. Information provided by the LTR included race, date of birth, American Joint Committee on Cancer (AJCC) stage, summary stage, date of diagnosis, and date of first course of treatment. Breast cancer cases were staged using both AJCC defined stages (AJCC Cancer Staging Manual, 1977) and 1997 and 2000 SEER summary stages as provided by the LTR (Young et al., 2001). According to NAACCR, 1997 and 2000 summary stages for breast cancer do not differ (Howe et al., 2007).

The MCLNO electronic medical record contains individual patient information including patient demographics and personal information; visit and patient history; and laboratory, pathology, and radiology results. The records were reviewed, and information pertaining to date of presentation with first abnormality and type of abnormality was abstracted. White and AA women represented more than 96% of the cases; therefore, other races were not included in the analyses. Date of diagnosis and date of initiation of treatment were provided by the LTR, as defined by NAACCR. Date of diagnosis was defined as "date of initial diagnosis by a recognized medical practitioner for the tumor being reported whether clinically or microscopically confirmed." Date of initiation of treatment was defined as the date of initiation of the first course of therapy.

Date of abnormality was assigned as either the date of the first abnormal mammogram or the date of presentation at the medical service if the abnormality was first detected as a physical sign or symptom. Physical signs included a palpable mass, nipple retraction, nipple discharge, peau d'orange, and ulceration. Symptoms were defined as any patient complaint that led to a diagnosis of breast cancer and included breast pain, headache, or leg numbness.

Time from abnormality to diagnosis was the number of days from the date of the detection of the first abnormality to the date of the diagnosis provided by the LTR. Time from diagnosis to initial treatment was the number of days from the date of the diagnosis to the date of the initiation of treatment. Treatment types included surgery, chemotherapy, radiation, other (including hormone therapy), and no treatment. Patients were assigned to the category of no treatment if they returned to their medical facility at least once after receiving a diagnosis of breast cancer, but no treatment type was indicated

in their records. This date was then used to compute their time to treatment. Hence, the assumption was made that if a patient returned to a medical facility after receiving a diagnosis of breast cancer, she was informed of her treatment options, even if no treatment was subsequently recorded in her medical records. This was done to avoid artificially inflating treatment times by those patients choosing not to receive treatment or those patients for whom treatment was not recommended due to the advanced nature of their disease. Based on the information contained in the patients' records, no patient died before initiating treatment or returning to a clinic after receiving a diagnosis of breast cancer. Only two patients never returned to a medical facility after receiving a diagnosis of breast cancer. One of these patients presented with a palpable mass, while the other patient had AJCC stage IV cancer. Hence it was unrealistic to assume that these patients survived for more than 4 years (the time from diagnosis to abstraction date). These two patients' were assigned treatment times equal to the next largest treatment time in the dataset (234 days).

Diagnosis and treatment times were presented as both continuous and dichotomous ($\leq$60 days, no delay; >60 days, delay) variables. The delay definition (>60 days) was based upon the CDC NBCCEDP (2007) standard. Late-stage disease was defined as AJCC stage III or IV; all other stages were classified as early. Abnormalities were defined as mammographic finding, palpable mass, or other. Multiple physical findings that included a palpable mass were coded as "other." The type of medical service at which the patient presented when the initial abnormality was discovered was classified as a primary care, emergency room or urgent care, other, or unknown.

The study was approved by the Louisiana State University Health Sciences Center Institutional Review Board and the Interim Hospital and Clinics Research Review Committee.

Statistical Analysis

Proportional differences in diagnostic and treatment delays and were determined using chi-square tests. Group differences (race and delay status) for continuous variables were tested using Wilcoxon signed rank tests. To determine the independent significance of potential explanatory variables in delays in a multi-variable fashion, logistic regression was used. The dichotomous forms of delay (>60 days) or no delay ($\leq$60 days) were used as the outcome variables in the models, while race (AA or white), age, AJCC stage (early or late), tumor size, abnormality type (mammography or other), medical service (clinic, emergency room/urgent care, or other), prior mammography (yes or no), and year of diagnosis (2002, 2003, or 2004) were considered possible explanatory variables. For treatment delay, the categorical diagnostic delay was also examined as a potential explanatory variable. Additionally, interaction terms for race with the other explanatory variables

were added to the models to determine if race had any moderator effects. All variables and interaction terms were initially included in the model. Variables were removed in a step-wise fashion, retaining only those variables whose coefficients were significant at the 0.05 level. Profile likelihood odds ratios (OR) and 95% confidence intervals (CI) were computed for significant explanatory variables in the final models. Diagnostic tests were run on the final models and included influence and predicted probability plots of Pearson residuals, deviance residuals, and leverage. All analyses were performed using SAS® software, version 9.2 (SAS Institute Inc., Cary, North Carolina, USA) or SPSS® software, version 16.0 (SPSS Inc., Chicago, Illinois, USA).

RESULTS

Of the 247 cases initially identified by the tumor registry as female, first primary breast cancers, nine were excluded from analysis based upon race (other than AA or white, or missing). Of the remaining 238 cases, 195 (82%) were AA and 43 (18%) were white (Table 1), with a median age of 53 years (range 27–87 years); (Table 2). Approximately 25% of the cases were diagnosed at late stage, with the majority (50.2%) of the cases presenting with a palpable mass (Table 1) and a median tumor size of 23 mm (Table 2). Less than one-fourth (24.2%) of the cases reported having a prior mammogram in the past 2 years, while 30.8% and 13.0% of the cases experienced diagnostic and treatment delays, respectively (Table 1). Median diagnostic and treatment delays were 34 and 25 days, respectively (Table 2). African American and white women showed no significant differences in median age, tumor size, diagnostic delays, and treatment delays (Table 2) or in proportions of stage of disease at presentation and type of abnormality at detection (Table 1). However, significant racial differences were found in medical services and prior mammography (Table 1) with the majority of AA women presenting at clinic, while the majority of white women presented at emergency facilities. More AA women reported having had a prior mammogram compared to white women (27.5% versus 8.3%, respectively). Significantly more AA women experienced diagnostic delays compared to white women (33.8% versus 16.7%, respectively), while more white women experienced treatment delays compared to AA women (20.9% versus 11.3%, respectively, $p = 0.089$).

Significant associations were found between diagnostic and treatment delays and selected health care characteristics (Table 3). Significantly more early-stage cases experienced diagnostic delays compared to late stage (35.1% versus 20.7%, respectively, $p = 0.041$), but a significant difference was not observed for treatment delays. Additionally, significantly more women presenting with an abnormal mammogram experienced diagnostic delays than those presenting with other abnormalities (41.9% versus 24.2%, respectively, $p = 0.0046$). Women experiencing treatment delays were significantly older

TABLE 1 Demographic and Health Care Characteristics (Categorical Variables) of Breast Cancer Cases at the Medical Center of Louisiana at New Orleans, 2002 to 2004

	Total			African American			White			
Characteristic	*N*	*n*	%	*N*	*n*	%	*N*	*n*	%	*P*
Race	238									
African American		195	81.9							
White		43	18.1							
AJCC stage	230			187			43			NS
In situ		21	9.1		16	8.6		5	11.6	
I		54	23.5		44	23.5		10	23.3	
II		97	42.2		80	42.8		17	39.5	
III		31	13.5		26	13.9		5	11.6	
IV		27	11.7		21	11.2		6	14.0	
Abnormality	235			193			42			NS
Mammogram		86	36.6		71	36.8		15	35.7	
Palpable mass		118	50.2		96	49.7		22	52.4	
Other		31	13.2		26	13.5		5	11.9	
Medical service	187			155			32			0.0406
Clinic		93	49.7		82	52.9		11	34.4	
ER		81	43.3		65	41.9		16	50.0	
Other		13	7.0		8	5.2		5	15.6	
Prior mammogram	214			178			36			0.0143
No		162	75.7		129	72.5		33	91.7	
Yes		52	24.3		49	27.5		3	8.3	
Year of diagnosis	238			195			43			NS
2002		83	34.9		69	35.4		14	32.6	
2003		78	32.8		65	33.3		13	30.2	
2004		77	32.4		61	31.3		16	37.2	
Treatment type	238			195			43			NS
Surgery		180	75.6		146	74.9		34	79.1	
Chemotherapy		35	14.7		29	14.9		6	14.0	
Radiation		7	2.9		6	3.1		1	2.3	
Other		7	2.9		6	3.1		1	2.3	
No treatment		9	3.8		8	4.1		1	2.3	
Diagnostic delay	237			195			42			0.0287
No		164	69.2		129	66.2		35	83.3	
Yes		73	30.8		66	33.8		7	16.7	
Treatment delay	238			195			43			NS
No		207	87.0		173	88.7		34	79.1	
Yes		31	13.0		22	11.3		9	20.9	

Note. *P* = Chi square *p*-value for comparison between races; NS = not significant at the 0.05 level.

than their counterparts not experiencing delays (difference in median age = 8 years, $p = 0.0025$). Similar to stage of disease, median tumor sizes were significantly smaller for cases experiencing diagnostic delays compared to their counterparts (25 versus 20 mm, respectively, $p = 0.014$), while they were larger for cases experiencing treatment delays compared to their counterparts (35 versus 22 mm, respectively, $p = 0.073$).

The multi-variable logistic regression analyses revealed that only race and stage of disease were significantly related to the diagnostic delay in

TABLE 2 Demographic and Health Care Characteristics (Continuous Variables) of Breast Cancer Cases at the Medical Center of Louisiana at New Orleans, 2002 to 2004

	Total						African American				White				
Characteristic	*N*	Mean	Med	SD	Min	Max	*N*	Mean	Med	SD	*N*	Mean	Med	SD	*P*
Age (years)	238	52.9	53.0	10.8	27	87	195	52.7	52.0	11.1	43	54.0	55.0	9.7	NS
Tumor size (mm)	220	33.5	23.0	30.8	1	200	180	32.5	23.0	28.7	40	37.8	23.5	39.3	NS
Diagnosis time (days)	237	56.4	34.0	77.8	0	510	195	61.1	35.0	83.9	42	34.7	27.0	29.7	NS
Treatment time (days)	238	31.2	25.0	38.5	0	234	195	30.4	23.0	36.8	43	35.1	25.0	45.6	NS

Note. Med = median, SD = standard deviation, Min = minimum, Max = maximum; NS = not significant at the 0.05 level.

TABLE 3 Associations Between Diagnostic and Treatment Delays and Health Care Characteristics of Breast Cancer Cases at the Medical Center of Louisiana at New Orleans, 2002 to 2004

	Diagnostic delay				Treatment delay			
Characteristic	*N*	*n*	%	*p*	*N*	*n*	%	*P*
AJCC stage				0.041				NS
Early	171	60	35.1		172	19	11.0	
Late	58	12	20.7		58	10	17.2	
Abnormality				0.0046				NS
Mammogram	86	36	41.9		86	13	15.1	
Other	149	36	24.2		149	18	12.1	
Medical service				NS				NS
Clinic	93	35	37.6		93	12	12.9	
ER	81	23	28.4		81	14	17.3	
Other	13	3	23.1		13	1	7.7	
Prior mammogram				NS				NS
No	162	49	30.2		162	22	13.6	
Yes	52	20	38.5		52	5	9.6	

	Diagnostic delay = no				Diagnostic delay = yes				
	N	Mean	Med	SD	*N*	Mean	Med	SD	*p*
Age (years)	164	52.4	51.0	11.00	73	54.0	55.0	10.33	NS
Tumor size (mm)	154	36.2	25.0	32.56	66	27.2	20.0	25.45	0.014

	Treatment delay = no				Treatment delay = yes				
	N	Mean	Med	SD	*N*	Mean	Med	SD	*p*
Age (years)	207	52.2	51.0	11.1	31	57.6	59.0	7.66	0.0025
Tumor size (mm)	193	32.7	22.0	31.3	27	38.7	35.0	26.91	0.073

Note. Med = median, SD = standard deviation; NS = not significant at the 0.05 level.

TABLE 4 Multi-Variable Logistic Regression Model Results for Diagnostic and Treatment Delays of Breast Cancer Cases at the Medical Center of Louisiana at New Orleans, 2002 to 2004

Model variables	OR	95% CI
Diagnostic Delay[1]		
Race: (AA) vs. white	2.7	1.19, 6.93
AJCC stage: early vs. late	2.1	1.05, 4.43
Treatment delay[2]		
Age: per 10-year increase	1.6	1.12, 2.26

Note. OR = Odds ratio, 95% CI = 95% confidence interval.
[1]Age, tumor size, abnormality type, medical service, prior mammography, and year of diagnosis were not significant at the 0.05 level and, hence, were dropped from the final model.
[2]Race (AA vs. white), stage of disease, tumor size, abnormality type, medical service, prior mammography, year of diagnosis, and diagnostic delay status were not significant at the 0.05 level and, hence, were dropped from the final model.

multiple logistic regression modeling (Table 4). Age, tumor size, abnormality type, medical service, prior mammography, and year of diagnosis were not significantly related and, hence, were dropped from the model. African American women had 2.7 times the odds of experiencing a diagnostic delay as white women (OR 95% CI = 1.19–6.93), while women with early-stage disease had 2.1 times the odds of women with late-stage disease (OR 95% C = 1.05–4.43). African American women with early-stage disease had the highest predicted probability of experiencing a diagnostic delay, while white women with late-stage disease had the lowest (Figure 1). For treatment delay, only age had a significant effect in the model. Race, stage of disease, tumor size, abnormality type, medical service, prior mammography, year of diagnosis, and diagnostic delay status were not significantly related to treatment delay and, hence, were dropped from the model. For every 10-year increase in age, the odds of experiencing a treatment delay increased 1.6 times (OR 95% CI = 1.12–2.26).

DISCUSSION

The purpose of this study was to determine factors significantly associated with delays in diagnosis and treatment of breast cancer in 238 white and AA women from the MCLNO. From 2002–2004, 31% of women at the MCLNO experienced delays in diagnosis, defined as greater than 60 days from clinical presentation with initial abnormality to diagnosis of breast cancer. This greatly exceeds the CDC NBCCEDP (2007) benchmark of less than 20%. The study concludes that race, AJCC stage, type of abnormality at presentation, and tumor size were all significantly associated with diagnostic

delays. African American race, AJCC early-stage classification, abnormality found by mammogram, and decreasing tumor size were all risk factors for diagnostic delays. Only race and AJCC stage remained significant when all factors were considered together. Similar to the findings of this study, other studies have also reported that a greater proportion of AA women experienced diagnostic delays compared to white women (Gorin et al., 2006; Gwyn et al., 2004; Lund et al., 2008; Wujcik et al., 2009).

Jones et al. (2005) reported that 28% of women did not receive follow-up care within 3 months after a mammographic abnormality in five Connecticut healthcare facilities. In the population of women in this study, the proportion of patients who experienced diagnostic delays after mammographic abnormality was even higher, at 42%, which is especially troubling. However, it is not surprising that proportionately more diagnostic delays are seen with mammographic abnormalities because mammographic abnormalities often require more extensive diagnostic testing than other abnormal findings for breast cancer. For example, an abnormal screening mammogram may lead to a diagnostic mammogram, additional mammographic views, or an ultrasound prior to biopsy (NCCN Drugs & Biologics Compendium, 2009). These additional tests would require multiple appointments be kept before a final diagnosis of breast cancer is made. Conversely, when a patient presents with a palpable abnormality, a biopsy or fine needle aspiration can be quickly scheduled, often the same day. Similarly, if a patient presents with an ulceration or large mass, the urgency of the situation is obvious and diagnosis is immediate. Smaller masses found by mammography may not be treated with the same sense of urgency as these other more obvious signs, thus resulting in diagnostic delays.

The increased risks for diagnostic delay for early-stage breast cancer and smaller tumor size were unexpected. Given the evidence indicating the potential adverse effects of delays on outcomes, it is expected that diagnostic delays would be associated with larger tumor size or late-stage disease. However, perhaps the same mechanisms are at work here as with diagnostic delays found with abnormal mammographic findings. That is, early-stage disease and smaller tumors are not treated with the same sense of urgency as late-stage disease and larger tumors. This is unfortunate because prognosis is much more positive for breast cancer when detected and treated early (Anderson, Jatol, & Devesa, 2006; Blanchard et al., 2004; Collette et al., 1984; Gofman, 1996; Nyström et al., 2002; Tabar et al., 2003; Randolph et al., 2002; Shapiro, Strax, & Venet, 1971; Shapiro, Venet, & Strax, 1982; Tabar et al., 1985; Verbeek et al., 1984), and this phenomenon may partly explain the racial disparity in breast cancer mortality among Louisiana women. In the sample of women in this study, the higher probability of experiencing a diagnostic delay with early-stage disease was compounded by race, with AA women having almost twice the probability compared to their white counterparts with early-stage disease.

From 2002–2004, 13% of women at the MCLNO experienced delays in treatment, defined as greater than 60 days from diagnosis of breast cancer to initiation of treatment. This study found that age was the only significant factor associated with diagnostic delays, although tumor size tended toward significance. Increasing age and tumor size were risk factors for treatment delays. When all factors were considered together, again, only age was significant.

Limitations of this study included the relatively small sample size, the use of data from a single institution, and the retrospective nature of the data. The small numbers of white women and cases experiencing diagnostic delays limited the statistical power and, thus, the ability of this study to detect statistically significant associations between variables of interest, especially racial differences. Additionally, the use of a single safety net hospital limits the generalizability of the study results to state (Louisiana) and national populations of women. The MCLNO is located in a predominantly AA, southern, urban center. A high proportion of patients have low incomes and low education levels and are living in environments that are not conducive to wellness, making them high risk for poor health. Due to the retrospective nature of this study, opportunities to question patients concerning reasons for the delays in breast cancer diagnosis and treatment did not exist. Therefore, it is not possible to determine causality for diagnosis and treatment delays, nor is it possible to determine if causality (e.g., health care systems, provider factors, patient characteristics) differed between white and AA women. Additionally, this study was unable to explore and control for potential socioeconomic differences between white and AA women, which could have contributed to racial differences in diagnostic delay because the necessary information was not collected by the hospital.

The results of this study support the hypothesis that poor outcomes in breast cancer observed among Louisiana AA women may be partly attributed to diagnostic delays. No evidence was found to support a similar hypothesis for treatment delays in Louisiana AA women. Further, no evidence was found to support the hypothesis that diagnostic delays are associated with late-stage disease—in fact, the opposite was true. However, the delay seen with early-stage disease was compounded by race, which may also partly explain the poorer outcomes seen in Louisiana AA women with breast cancer because prognosis improves when the cancer is detected and treated early. The fact that racial disparities in breast cancer outcomes in Louisiana exist is indisputable. However, the reasons for these disparities remain unclear and warrant further study.

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